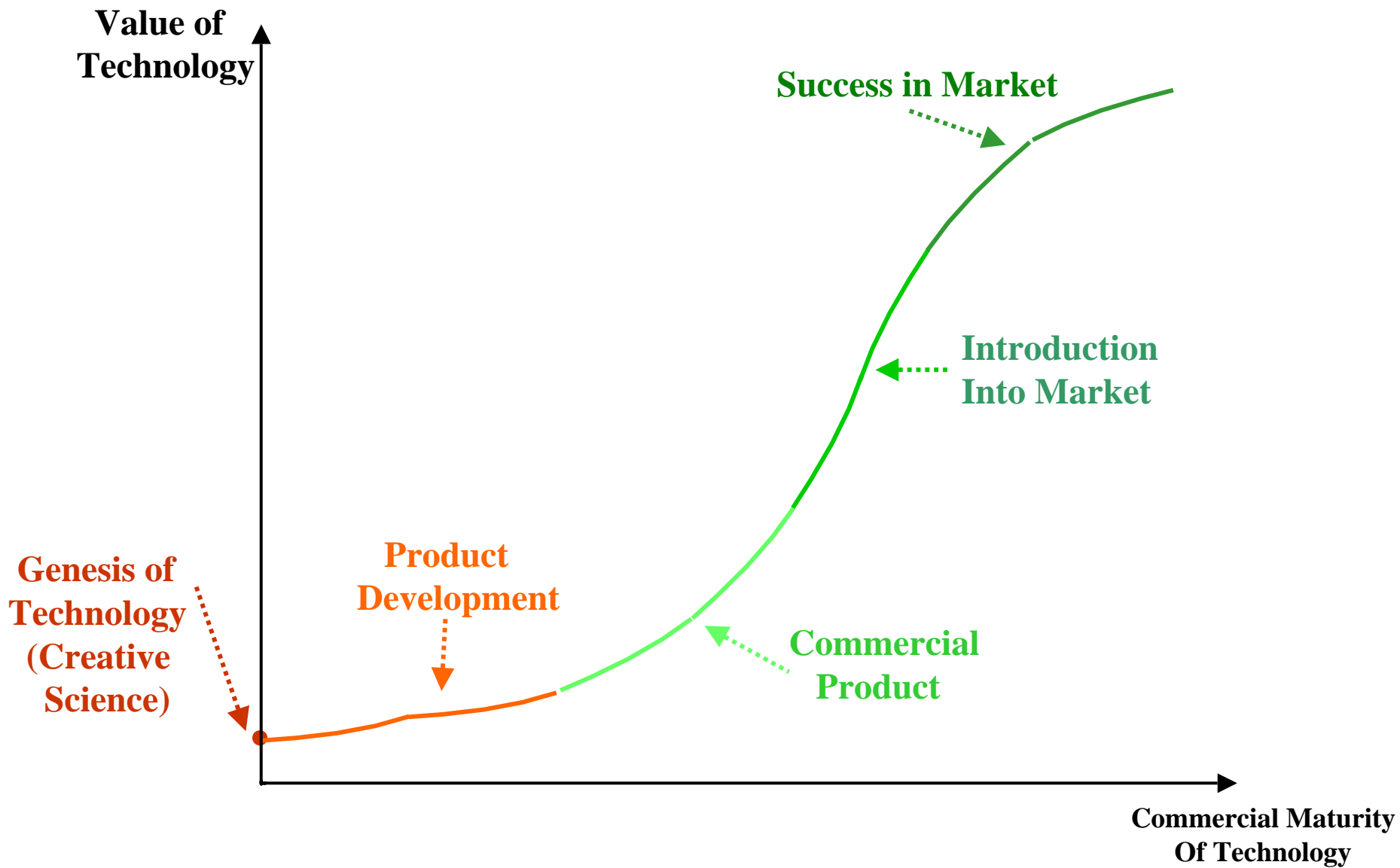


**The University as Agent
For
Economic Development:
Academic Entrepreneurism
And
Technogenesis**

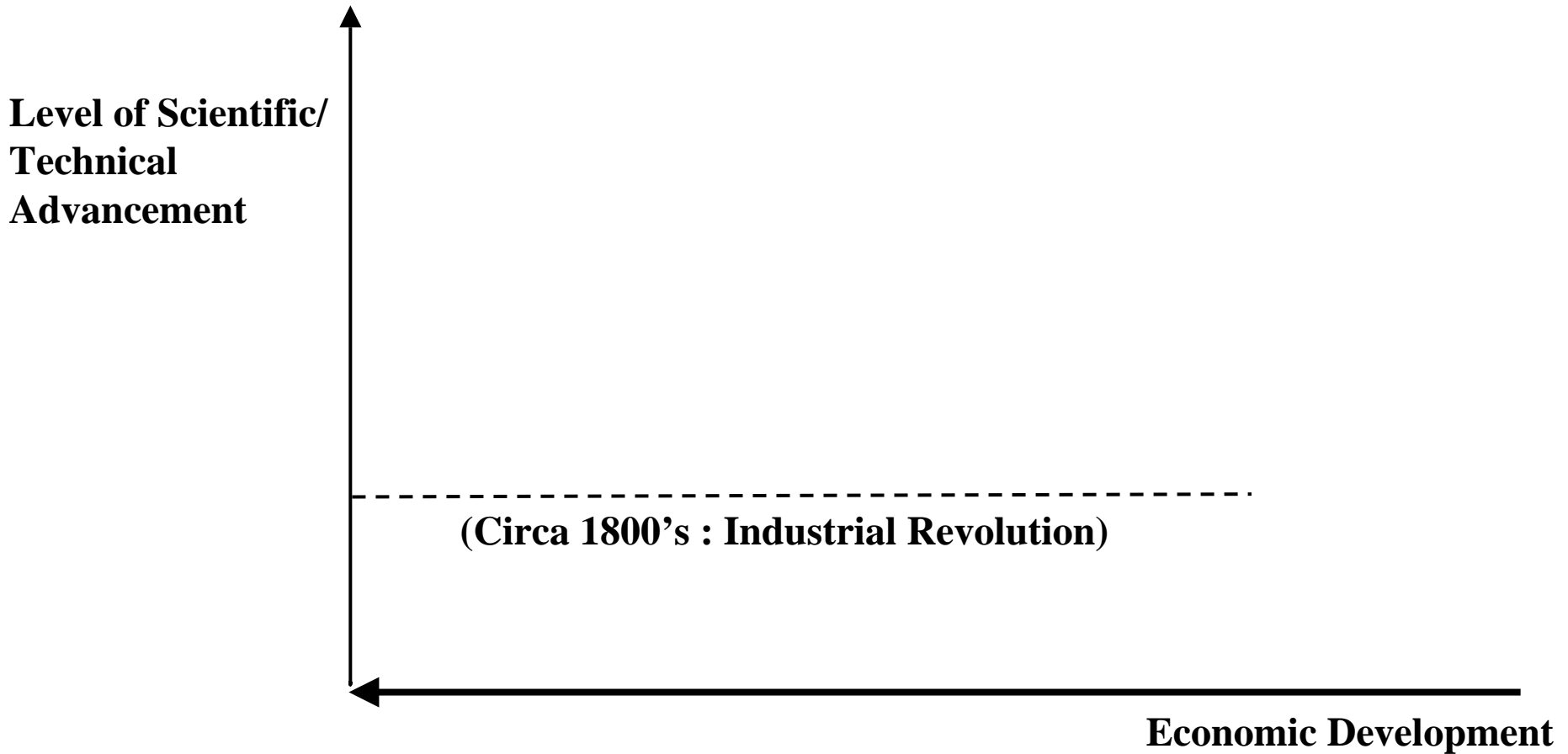
Erich E Kunhardt
Professor of Physics
Dean, Imperatore School of Science and Arts
Stevens Institute of Technology

Themes

- **The University (in Partnership with Gov't and Industry) and the Development of a Scientific and Technical Capability (at the Highest Level of Quality and Performance) Able to Fuel the Economic Development of a Nation**
 - **From Genesis of Technology to Identifying Candidate Technologies/Products for Industrialization**
 - **Effecting a Parallel-Entry Approach to Industrialization Through Science and Technology**
- **The Technogenesis Environment: Knowledge Transfer and the Education of Entrepreneurial Scientists and Engineers**
 - **Nurturing Companies (in contrast to Spin-off Companies)**

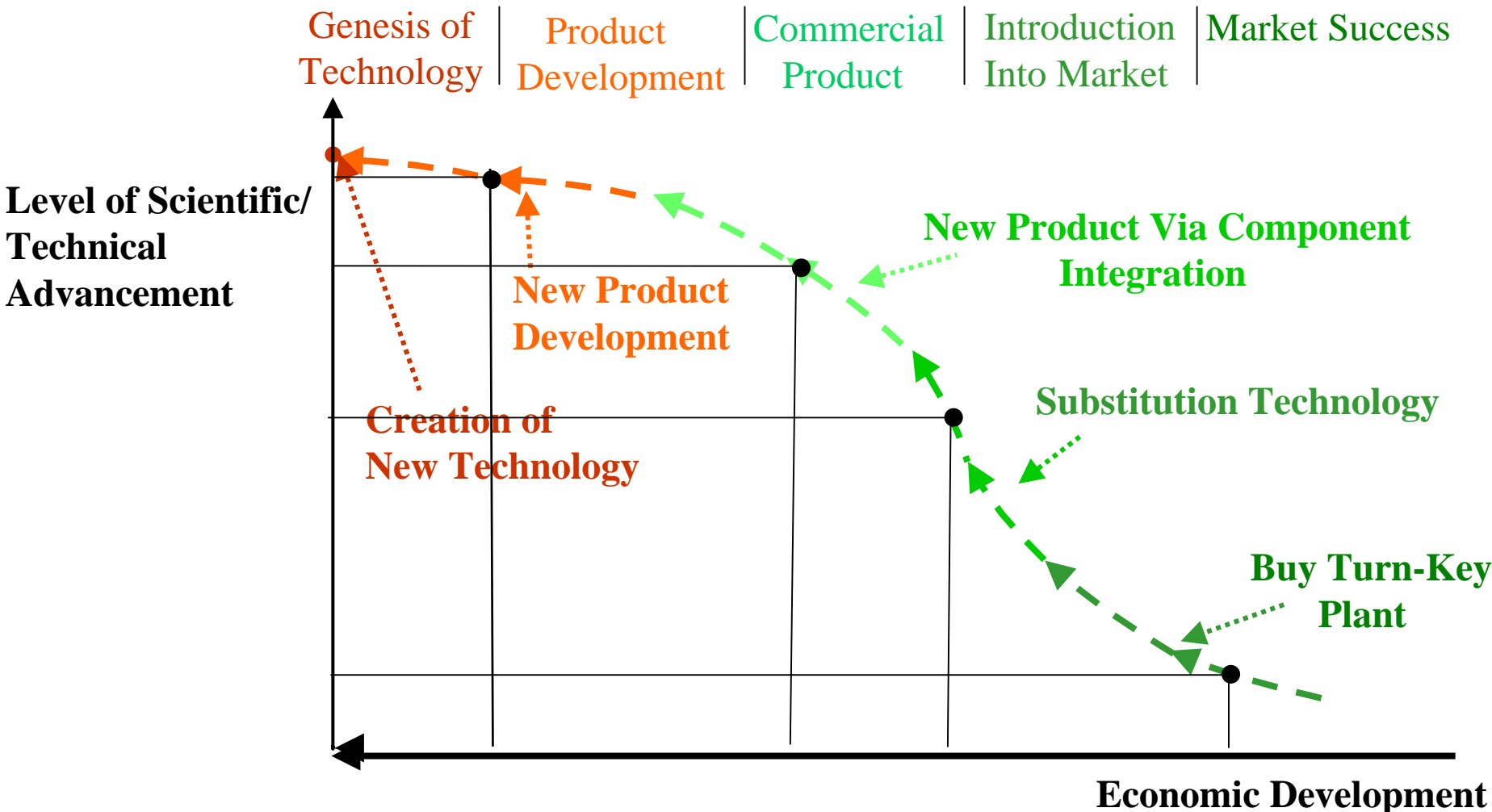


Technology-Evolution Curve

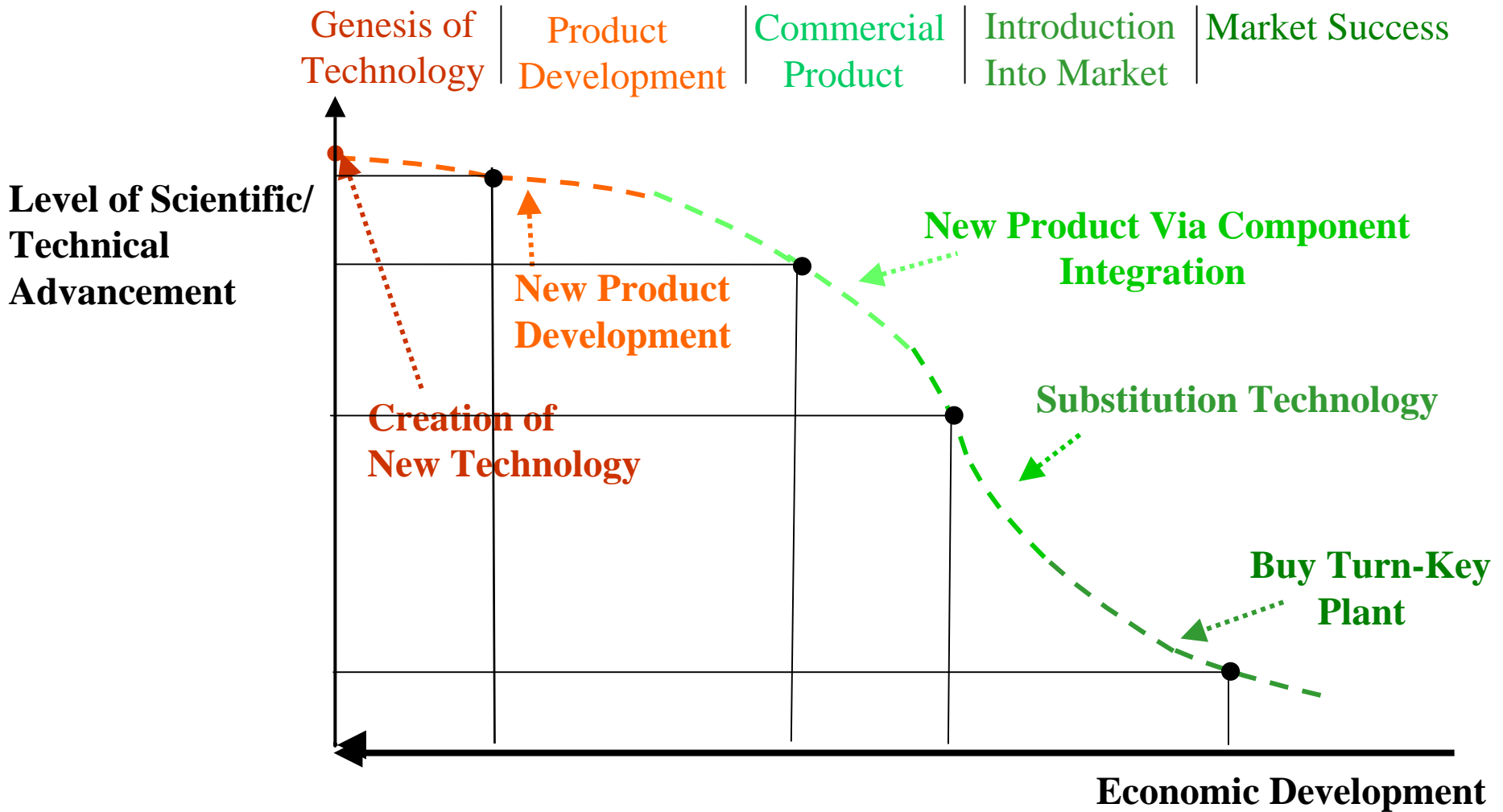


Progression of S & T Capabilities with Economic Development

- **As many inventions of the Industrial Revolution had been made by non-schooled amateurs and inventors as the trained scientists – No significant advantage provided by S&T capabilities for economic development**



Progression of S & T Capabilities with Economic Development
Circa 1970's -1980's ("Asian Tigers")

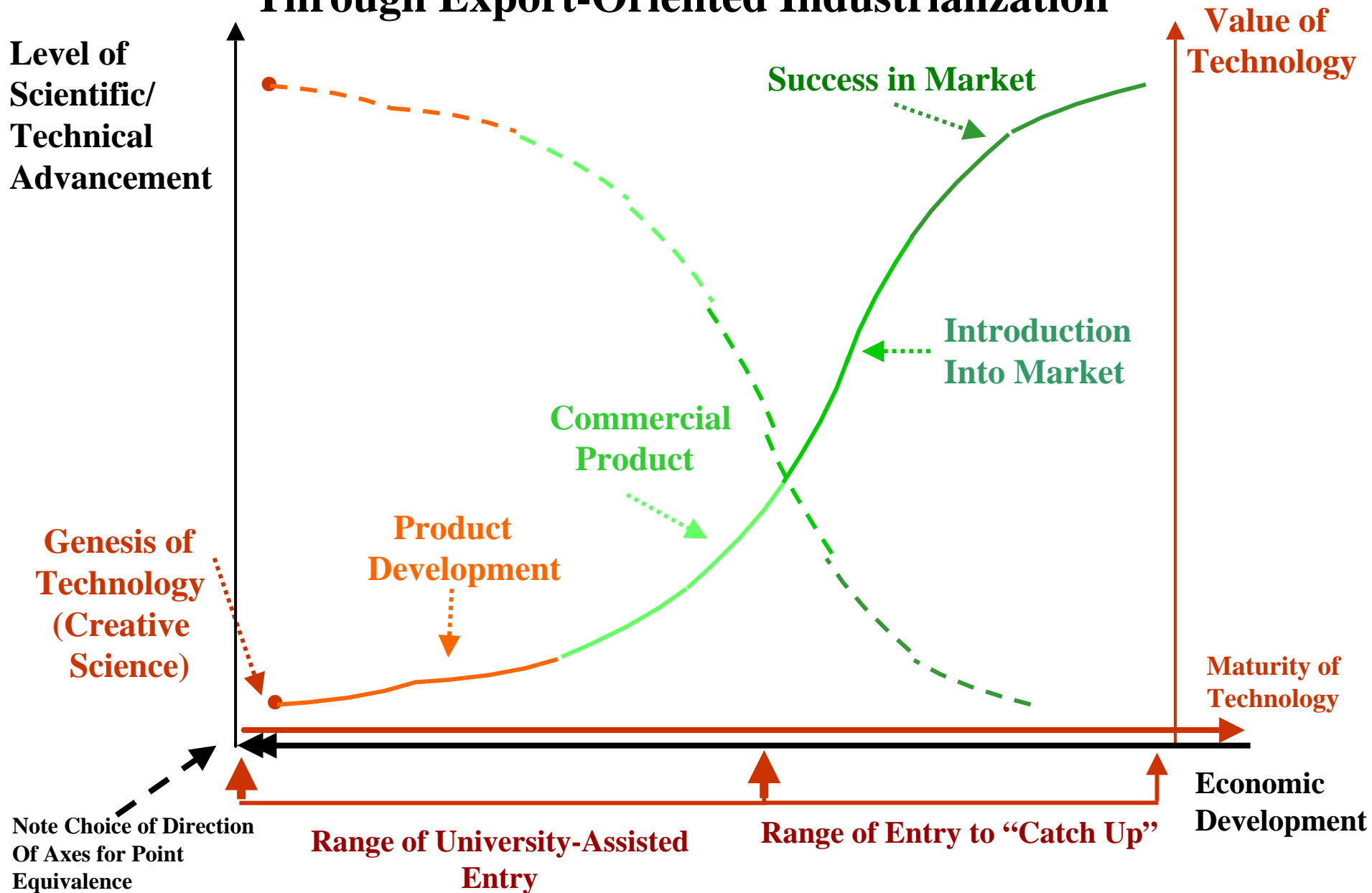


Progression of S & T Capabilities with Economic Development

- Discoveries in the present technological revolution are being made by persons with advanced degrees:

Global economic competitiveness depends on Universities!

Parallel-Entry Approach to Economic Development Through Export-Oriented Industrialization



- **Requirement:** University - The Suitable Technology/ Partner for Mid-Entry

Global Economic Competitiveness Policy

- As many inventions of the Industrial Revolution had been made by non-schooled amateurs and inventors as the trained scientists; discoveries in the present technological revolution are being made by persons with advanced degrees.

Global economic competitiveness depends on Universities!

- Globalization underline the importance of higher education to technoscience, to industrial policy, and to intellectual property strategies.

Universities are critical to production of technoscience!

Summary

- **In Parallel-Entry Phase, Using Readily Available Technical Journals and Patent Registrations, Assess Available Technology Systems/Products Suitable for Mid-Entry Commercialization**
- **Globalization Underline the Importance of Higher Education to the Creation of New Technologies, to Industrial Policy, and to Intellectual Property Strategies.**

**Universities are Critical Producers of Know-How
(A Source of Disruptive-Technologies!)**

- **Create New, Disruptive Technologies, as Well as Innovate, Engineer, Design and Commercialize These Technologies: Technogenesis**

Themes

- **The University (in Partnership with Gov't and Industry) and the Development of a Scientific and Technical Capability (at the Highest Level of Quality and Performance) Able to Fuel the Economic Development of a Nation**
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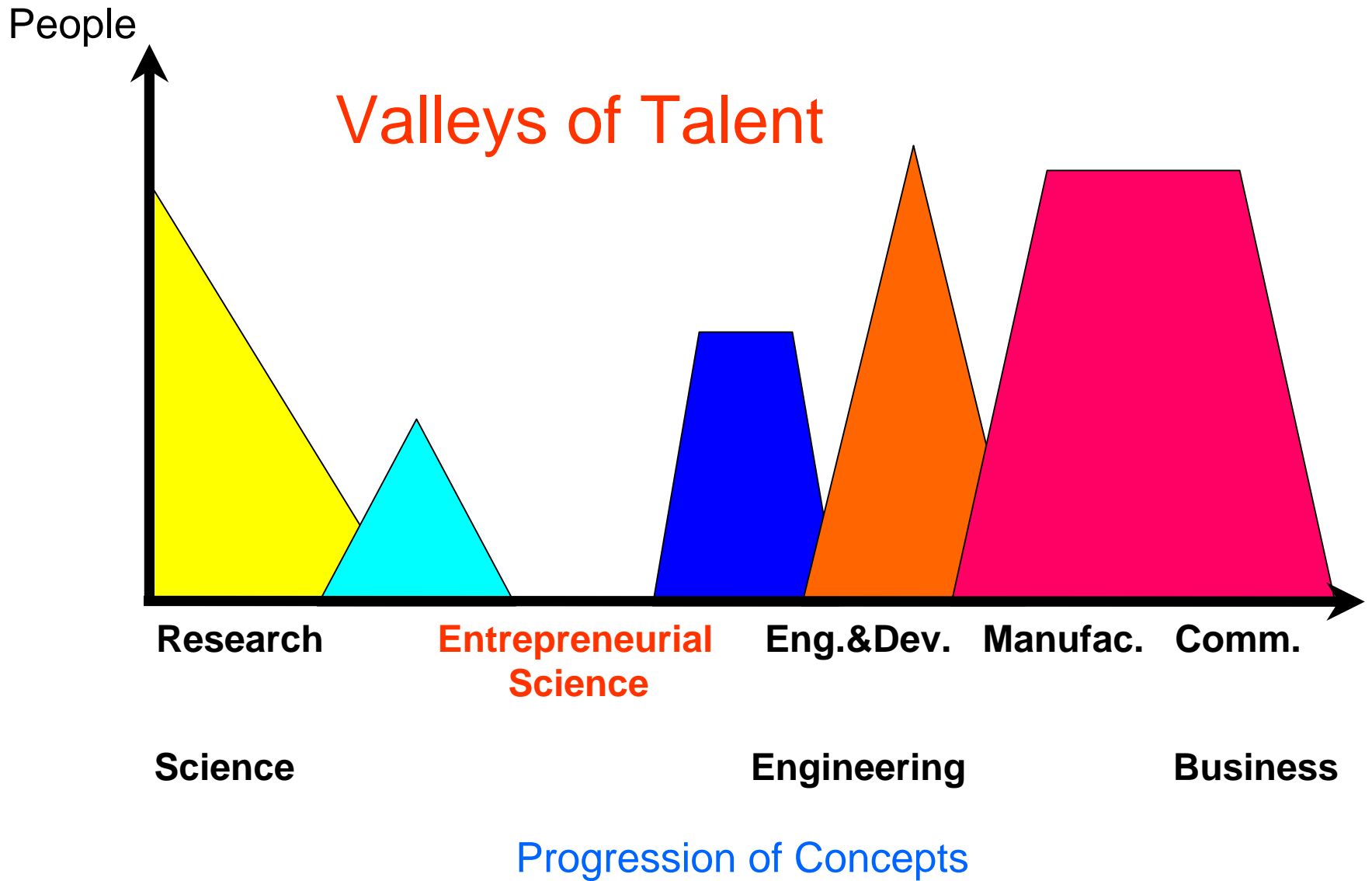
Technogenesis: An Educational Environment Where,

- **Faculty, with support from graduate students, engage in research (from “basic – to – applied”) “plus” (technogenesis).**
- **Through a policy of incentives and community awareness, the collective mission of the research enterprise becomes “Science For Innovative Technologies”.**
- **Entrepreneurial academics, with partners, establish “Nurturing Companies” with “special ties” to the Institute. These companies are reflections of the intellectual capabilities of the Institute.**
- **The unique concept for Higher Learning is that the resulting environment, created by faculty and graduate students (!), serves as setting for undergraduate education (!). Graduate and undergraduate education become integrated.**
- **....and create wealth for individuals, Institute and community!**

The Assembly Line of Knowledge Transfer :

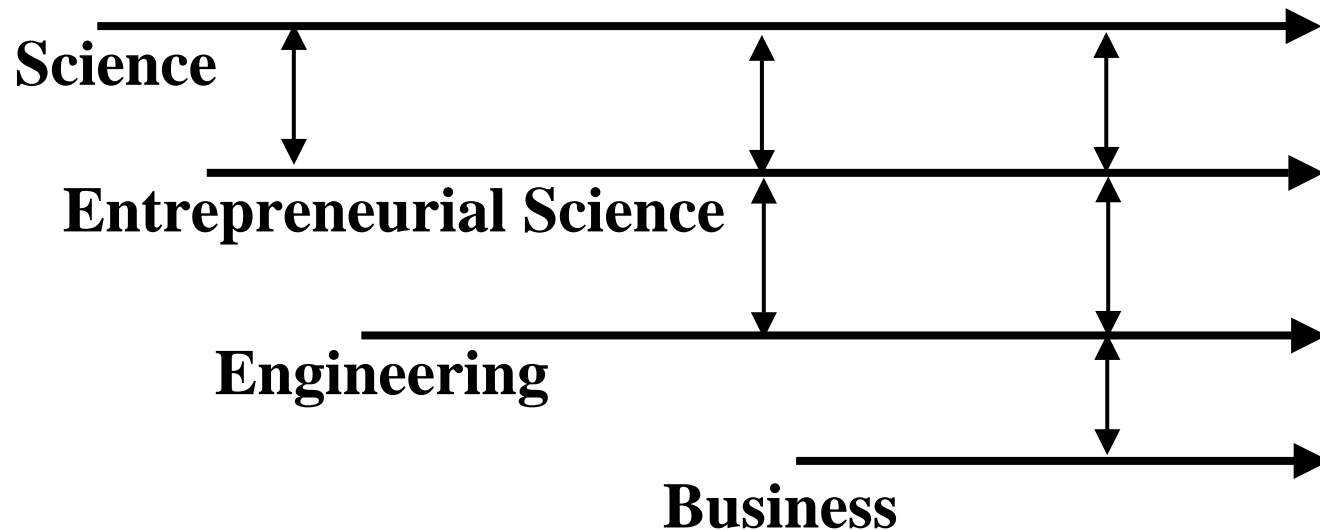
The “Traditional” Approach

Science → Applied Science → Engineering → Business



Knowledge Transfer “Family Style”:

The Technogenesis Nurturing Process



“ Technology Nurturing” is the passing on of concepts/ideas with great overlap and creating a “whole technology environment”.

Developing the Technogenesis Environment

The key operational issues in the development of this environment fall into five categories:

- ✧ Creating a community of people with the proper skill-set and common purpose**
- ✧ Creating incentives in this community through Intellectual Property (IP) policies**
- ✧ Facilitating the nurturing process**
- ✧ Establishing and growing the “nurturing companies”**
- ✧ Establishing the guidelines for educational contribution of nurturing companies**

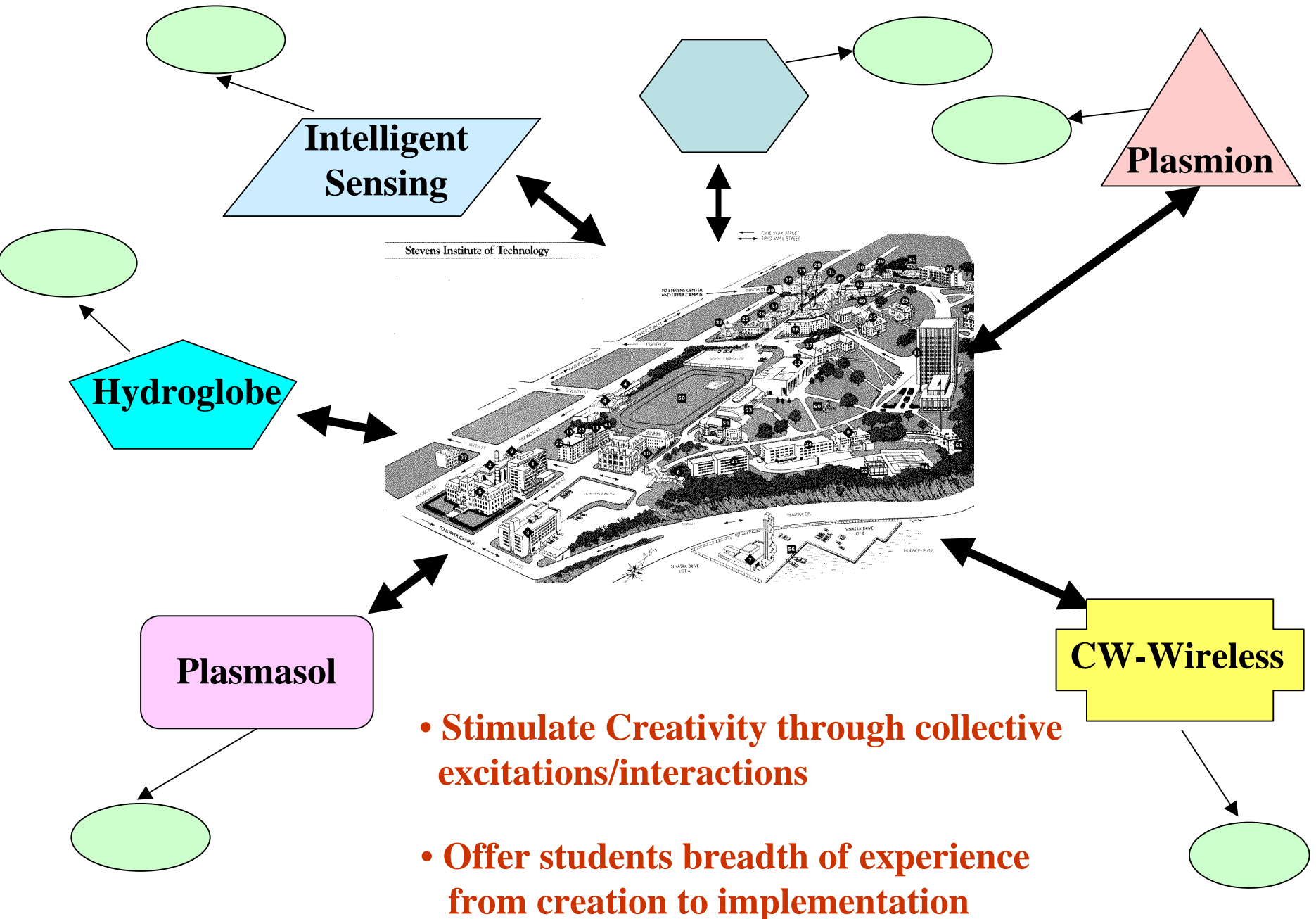
Incentives to Faculty and Students for Participation in Nurturing Companies

- **Founders equity in companies formed**
- **IP generated in collaborative effort with company assigned exclusively to company**

Incentives to Nurturing Company for Success in Marketplace

- **% of Stevens equity returned, at no cost, to company according to pre-established set of milestones**

The Model of Stevens



Summary

- **Technogenesis: An Environment for Entrepreneurial-Science and Management**
 - Collective Approach to Knowledge Transfer from Creation to Technology Implementation
 - Inclusion of Undergraduates: The Technogenesis Experience
- **Nurturing Companies**
 - A Reflection of the Intellectual Capability of the Institute
 - Integrated into the Educational Experience